WHAT IS CLAIMED IS:

1. A code-modulation adaptive and variable multiplexing transmission apparatus, comprising:

a data dividing circuit for dividing transmission data into transmission signals on plural transmission sub-channels;

a primary modulator and a secondary modulator provided for each of said plural transmission sub-channels, said primary modulator performing a multi-level modulation to a transmission signal on said transmission sub-channel transmitted from said data dividing circuit, said secondary modulator performing a transmission-band-broadening on a multi-level-modulated signal acquired from said primary modulator;

an addition circuit for adding transmission-condition information to each transmission signal of an associated transmission sub-channel, said transmission-condition information including a multi-level modulation scheme of said primary modulator and a band-broadening scheme of said secondary modulator for each of said plural transmission sub-channels, and the number of said plural transmission sub-channels; and

a frequency multiplexing circuit for frequency-multiplexing band-broadened multi-level-modulated outputs acquired from the respective secondary modulators on said plural transmission sub-channels, and outputting a resultant frequency-multiplexed signal as a channel for a user.

2. The apparatus according to Claim 1, wherein said primary modulator provided for each of said plural transmission sub-channels is arranged to select an arbitrary multi-level modulation scheme from among plural multi-level modulation schemes, said secondary modulator provided for each of said plural transmission sub-channels being arranged to select an arbitrary band-broadening scheme from among plural band-broadening schemes.

3. The apparatus according to Claim 2, wherein said plural multi-level modulation schemes include BPSK, QPSK, and 16QAM, said plural band-broadening schemes including OFDM and spectrum spreading.

4. The apparatus according to Claim 1, wherein said primary modulators provided for said respective plural transmission sub-channels are arranged to use one and the same multi-level modulation scheme on said plural transmission sub-channels, said secondary modulators being also arranged to use one and the same band-broadening scheme on said plural transmission sub-channels.

5. The apparatus according to Claim 1, wherein said plural transmission sub-channels are divided into plural groups of transmission sub-channels, said primary modulators provided for said respective plural transmission sub-channels being arranged to use one and the same multi-level modulation scheme within one and the same group of transmission sub-channels, said

secondary modulators being also arranged to use one and the same band-broadening scheme within one and the same group of transmission sub-channels.

6. The apparatus according to Claim 5, wherein respective ones of said plural groups of transmission sub-channels constitute respective channels that are allocated to different users.

7. The apparatus according to Claim 1, further comprising a coder provided at a preceding stage of said primary modulator provided for each of said plural transmission sub-channels, said coder performing an error-correction coding on said transmission signal on a transmission sub-channel associated therewith, said primary modulator performing said multi-level modulation to output data outputted from said coder.

8. The apparatus according to Claim 7, wherein said transmission-condition information added by said addition circuit to said transmission signal associated therewith further includes a coding scheme and a coding ratio used by said coder on said transmission sub-channel associated therewith.

9. The apparatus according to Claim 7, wherein said coder is arranged to select an arbitrary error-correction coding scheme and an arbitrary coding ratio from among plural error-correction coding schemes and plural coding ratios, respectively.

10. The apparatus according to Claim 9, wherein said plural error-correction coding schemes include

convolutional coding, Reed-Solomon, and BCH.

11. A code-modulation adaptive and variable multiplexing transmission apparatus, comprising:

a controlling circuit for generating a controlling signal based on transmission-condition information;

a data dividing circuit for dividing transmission data into each of transmission signals for each of plural transmission sub-channels;

a primary modulator provided for each of said plural transmission sub-channels and a secondary modulator connected to said primary modulator, wherein said primary modulator, responsive to said controlling circuit, selects a multi-level modulation scheme from among plural multi-level modulation schemes thereby to multi-level modulate a transmission signal associated therewith, and, said secondary modulator, responsive to said controlling circuit, selects a band-broadening scheme from among plural band-broadening schemes thereby to band-broaden a multi-level-modulated signal acquired from said primary modulator;

an addition circuit for adding said transmission-condition information to said transmission signal associated therewith, said transmission-condition information including a multi-level modulation scheme by said primary modulator, a band-broadening scheme by said secondary modulator, and the number of said plural transmission sub-channels, said multi-level modulation scheme and said band-broadening scheme being performed for each of said plural transmission sub-channels; and

a frequency multiplexing circuit for frequency-multiplexing band-broadened multi-level-modulated outputs, and outputs a resultant frequency-multiplexed signal as a channel for one and the same user, said outputs being acquired from said respective secondary modulators on said plural transmission sub-channels.

12. A code-modulation adaptive and variable multiplexing transmission apparatus, comprising:

a frequency separating circuit for frequency-separating a received frequency-multiplexed signal into a modulated signal for each of plural reception sub-channels;

a transmission-condition identifying circuit for identifying transmission-condition information added on a transmission side, said transmission-condition information including a multi-level modulation scheme in the primary modulation for each reception sub-channel, a band-broadening scheme in the secondary modulation for each reception sub-channel, and a number of reception sub-channels;

a controlling circuit for generating a controlling signal based on said transmission-condition information identified in said transmission-condition identifying circuit;

a secondary demodulator and a primary demodulator both provided for each of said plural reception sub-channels, wherein said secondary demodulator, responsive to said controlling circuit, demodulates a modulated signal of associated reception sub-channel acquired from said frequency separating circuit with a band-debroadening scheme corresponding to said band-broadening scheme identified in said transmission-condition identifying circuit, and wherein said primary demodulator, responsive to said controlling circuit, demodulates a signal from said secondary demodulator with a multi-level demodulation scheme corresponding to said multi-level modulation scheme identified in said transmission-condition identifying circuit; and

a data combining circuit for combining data acquired from said plural reception sub-channels.

13. A code-modulation adaptive and variable multiplexing transmission method, comprising the steps of:

dividing transmission data into transmission signals on plural transmission sub-channels;

performing a multi-level modulation to each of said transmission signals on said plural transmission sub-channels;

performing a transmission-band-roadening to each of multi-level-modulated signals on said plural transmission sub-channels;

adding transmission-condition information to each transmission signal, said transmission-condition information including a modulation scheme of said multi-level modulation, a modulation scheme of said band-broadening, and the number of said plural transmission sub-channels; and

frequency-multiplexing band-broadened modulated outputs on said plural transmission sub-channels, and outputting a resultant signal as a channel for one and the same user.

14. A code-modulation adaptive and variable multiplexing transmission method, comprising the step of:

frequency-separating a received frequency-multiplexed signal into a modulated signal for each of plural reception sub-channels by using a frequency separating circuit;

identifying transmission condition information added on transmission side in a signal on each of the transmission sub-channels by using a transmission condition identifying circuit, said information including a multi-level modulation scheme in a primary modulation and a band-broadening scheme in a secondary modulation performed on transmission side and a number of transmission sub-channels;

demodulating the modulated signal on each of reception sub-channels obtained from said frequency-separating circuit into a modulated signal by using an associated one of secondary demodulators provided one for each of said plurality reception sub-channels with a band-debroadening scheme corresponding to the band broadening scheme identified by said transmission condition identifying circuit;

demodulating said modulated signal on each of reception sub-channels obtained from said associated secondary demodulator by using an associated one of primary demodulators provided one for each of said plural reception sub-channels with a multi-level demodulating scheme corresponding to the multi-level modulating scheme identified by said transmission condition identifying circuit; and

combining data acquired from said plural reception sub-channels.